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# Changes in Hedonic and Eudaimonic Well-Being After a Severe Nationwide Disaster: The Case of the Great East Japan Earthquake

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# Changes in well-being after a severe nationwide disaster 1

Changes in hedonic and eudaimonic well-being after a severe nationwide disaster:

The case of the Great East Japan Earthquake

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## Abstract

This paper presents the results of a longitudinal survey ( $N = 10,744$ ) that examined how the Great East Japan Earthquake of March 2011 affected the hedonic and eudaimonic well-being of young people in Japan outside of the afflicted area. Our dataset consists of Japanese citizens in their 20s and 30s from all non-afflicted prefectures. We conducted two surveys on well-being, one before the earthquake (December 2010) and one after (March 2011). The results suggested that people who were thinking about the earthquake when they completed the second survey had slightly increased general well-being after the earthquake as compared to before, showing that reflecting on the earthquake had prompted them to reevaluate their lives and increased eudaimonia. However, they experienced temporary negative emotional reactions more frequently, which shows that their sympathy for those in the afflicted area decreased their hedonic well-being. After the earthquake, Japanese youth were likely to value social connectedness and ordinary life. Moreover, this mindset promoted prosocial behaviors such as making donations and volunteering.

(167 words)

Key words: disaster; hedonic well-being; eudaimonic well-being; social bond; prosocial behavior; culture

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## Changes in hedonic and eudaimonic well-being after a severe nationwide disaster:

## The case of the Great East Japan Earthquake

## 1. Introduction

How do people react to severe nationwide disasters? When severe disasters occur, their impact is felt not just by the people who are directly affected— people in comparatively safe areas are also psychologically affected by the disaster through broadcasted news or information obtained from newspapers and the Internet.

Japan has experienced the Great East Japan Earthquake that occurred in March 11, 2011. It was an exceptionally severe disaster, certainly the worst in the memory of contemporary Japan. Both the earthquake itself and the tsunami that it triggered brought disaster on a massive scale throughout the region. Many people lost everything—their family members, schools, workplaces, towns, and homes. More than 15,800 people were killed and around 2,800 people are still missing as of December 2012. The tragedy worsened when the Fukushima nuclear power plant, which had been affected severely by the tsunami and the earthquake, began to collapse. The damage resulting from these related disasters—the earthquake, tsunami, and nuclear plant accident—has been shared throughout Japan. Moreover, the shocking footage of the Tsunami and the extensive broadcast of scenes of the disaster psychologically impact even those who lived outside the directly affected area (Nikkei Newspaper, 2011, June 12). Many people were concerned about limited energy during the summer of 2011 because several nuclear power plants stopped operating. Many were also concerned about radioactive pollution. Although the situation caused much unrest, people were observed to remain calm and help each other. A large nationwide support network was established to assist people in the afflicted area.

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This study examined the psychological effect of such a huge disaster on the well-being (both eudaimonic and hedonic), attitude change toward life (e.g., evaluating ordinary life), and prosocial behaviors of people living in non-afflicted areas of Japan. How people evaluate their life and obtain well-being after experiencing such an immense nationwide disaster is a basic question for the literature of well-being and human behavior. Attitude toward life and prosocial behaviors are related to eudaimonic well-being because eudaimonia is related to one's assessment of the meaning of life and connectedness with other people. This research targeted Japanese young adults from all districts of Japan that were not afflicted following the earthquake. We obtained panel data from more than 10,000 respondents before and after the earthquake. The first survey was completed in December 2010, and the second survey was completed in March 2011, two to three weeks after the earthquake occurred. The same respondents completed both questionnaires, which allowed for direct comparison of the data to identify the effect of the disaster.

*1-1 .Hedonic and eudaimonic well-being after natural disasters.*

A nationwide tragedy would have a significant impact on psychological well-being; however, its impact on eudaimonic and hedonic well-being differs. Eudaimonic and hedonic well-being reflect correlated but different aspects of quality of life (Ryan & Deci, 2001; Delle Fave, Brdar, Freire, Vella-Brodrick, & Wissing, 2011). Hedonism, a doctrine attributed to the ancient Greek philosopher Aristippus, proposes that feeling pleasure is important. Hedonic well-being is measured by the occurrence of positive affect and the absence of negative affect (Kahneman, 1999). In contrast, eudaimonic well-being, a doctrine of the ancient Greek philosopher Aristotle, is explained by self-actualization, self-acceptance, or commitment to socially meaningful goals (Ryan, Huta, & Deci, 2008; Ryff & Singer, 2008). Hedonic well-being

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is focused on the outcome of good living and temporal emotional pleasure, whereas eudaimonic well-being focuses on the way one lives and achieves purpose in life.

In general, previous research has shown that national tragedies decrease people's hedonic well-being by increasing negative emotions. For example, the effect of the attacks of September 11, 2001, has been investigated in the US. To observe emotional reactions on the day of the attacks, Back, Küfner, and Egloff (2010) counted the number of emotional words sent to text pagers (573,000 lines and 6.4 million words from more than 85,000 pagers) within the US on September 11 from 6:45 a.m. on September 11 to 12:45 a.m. on September 12. They found that sadness increased with time but it was not the first emotion experienced. Anxiety was experienced first but reduced quickly. Moreover, anger was expressed soon after the attack and strongly increased with time. In addition, British respondents experienced decreased temporary well-being after the September 11 (Metcalfe, Powdthavee, & Dolan, 2011).

With the exception of studies focusing on posttraumatic stress disorder, very few have investigated how well-being is affected by natural disasters on a nationwide level, but those that have examined disasters show that they negatively affect hedonic well-being. For example, Frankenberg, Friedman, and Thomas (2009) suggested that after the tsunami in Indonesia, psychological stress increased in the severely damaged areas, and it decreased over time. Kimball, Kevy, Ohtake, and Tsutsui (2006) did investigate the broader impact of hurricane Katrina, which caused widespread damage in the US in August 2005. A survey on the emotional states of adults in the US from August 2005 to October 2005 found that the level of temporary negative emotions (emotions felt in the past week) increased in September 2005, when detailed information had filtered through to those areas that were outside the affected area. The media coverage of the extent of the damage and the broadcast of graphic scenes of the aftermath triggered widespread sympathy from around the world, which in turn affected the emotional state of those far away

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from the disaster itself. In sum, these studies suggest that national tragedies increase negative emotions and thus decrease well-being at the hedonic level.

While research conducted by Kimball et al. has provided important information on how disasters affect hedonic well-being, it is still not clear how individuals' eudaimonic well-being across a nation is affected by national disasters. Eudaimonic well-being involves value attached to social relationships and the community (Ryan et al., 2008); thus, if altruistic tendencies increase after a disaster, eudaimonic well-being could also be increased.

In the case of Great East Japan Earthquake, several reports have suggested (e.g., Dentsu Inc., 2011) that even for those who do not live in the afflicted area, the general perception of well-being in life may increase following a disaster of this magnitude. This implies that normal factors that might influence well-being become less important in the aftermath of a disaster. Another possibility is that a disaster leads people to lower their expectations of their life. In either case, people may reevaluate their situation in light of the disaster. Factors such as “having a house” or “having a family” may become far more important; people may realize that they are already happy enough.

*1-2. Attitudes toward life and prosocial behaviors after natural disaster.*

Attitude toward life and altruistic tendencies are closely related to eudaimonic well-being because it focuses on the meaning of life, the way one lives, and connectedness with others. We predict that if eudaimonic well-being changes after a nationwide disaster, attitude toward life and altruistic tendencies will also change.

One of the few studies on the psychological impact of natural disasters (except for studies conducted on PTSD) has been conducted by Nishimoto and Inoue (2004). They found that, even four to seven years after the Hanshin-Awaji earthquake around the Kobe area of Japan, people continued to experience a change in their attitude in some sense, including reevaluating the

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importance of *connectedness*. The same effect may have occurred following the Great East Japan Earthquake. For example, people were more likely to travel with their family members during a summer vacation in 2011 as compared to 2010, according to a travel company press release (JTB, 2011). We have to confirm whether this is really the case.

In recent times, much of Japanese society and many Japanese institutions have become increasingly focused on individualism, a trend that has been seen as more typical of European-American cultures (Uchida & Ogihara, 2012). In this shift, a greater emphasis has been placed on individual rights and independent personal evaluation or uniqueness (Norasakkunkit & Uchida, 2011). This increase in globalized cultural trends sometimes leads to intrapsychic conflict for Japanese people (Nishizawa, 2004). This is especially true for young people, who must grapple with a double set of standards in society—one that emphasizes obligation to the group, and social harmony, and one that focuses on individual uniqueness and independence (Toivonen, Norasakkunkit, & Uchida, 2011).

We predict that experiencing a natural disaster may have prompted many people to revert back somewhat to traditional cultural values. The inclination to engage in social relationships may occur universally after a disaster, but the importance of these relationships is particularly emphasized in Japanese culture. For example, Stephens, Hamedani, Markus, Bergsieker, and Eloul (2009) found that cultural models of agency affected the perception of people's actions after a disaster. They analyzed how American observers perceived survivors who evacuated or stayed in New Orleans during hurricane Katrina. Those who left New Orleans were more positively evaluated than those who stayed because evacuation is more likely to be perceived as agentic and independent behavior from the perspective of the disjoint model of agency, in which individuals are considered to be independent of each other and to have autonomy in decision making, a prevalent viewpoint in American middle-class cultural contexts.



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We also predict that the experience of a natural disaster will result in an increase in altruistic attitude along with reevaluation of social connectedness. After the Great East Japan Earthquake, social disorder or violence was rarely observed. Instead, pro-social behaviors such as volunteering and making donations were largely observed (Ishino, Kamesaka, Murai, & Ogaki, 2012). Ryan et al. (2008) suggested that eudaimonia is related to engagement in prosocial behaviors toward the community, since eudaimonic well-being involves self-realization, feeling good about oneself, and living well. Engaging in other-oriented social activities such as making donations or volunteering leads to a sense of satisfaction, based on the belief that one is serving and connecting to society. In fact, several studies have shown that prosocial or altruistic behaviors such as volunteering are related to eudaimonic and psychological well-being (e.g., Greenfield & Markus, 2004; Weinstein & Ryan, 2010; Morrow-Howell, Hiterlong, Rozario, & Tang, 2003; Piliavin & Siegl, 2007; Theurer & Wister, 2010). If people's eudaimonic well-being increases, they would also engage in prosocial behaviors such as making donations, and this altruistic tendency would be related to psychological experiences.

*1-3. Predictions of this study.*

In this study, we predicted both an increase in temporary negative emotions at the hedonic level, as in the Kimball et al.(2006), and an increase in eudaimonic well-being (changing attitude toward happiness, reevaluating life, and increasing altruistic tendencies) following the earthquake for those outside the afflicted area. In addition, these changes may result from individuals' cognitive and affective processing of the information about the disasters. There should be individual differences in people's responses; some are less disposed to being sympathetic and thus, would be less influenced by this event. We took these individual differences into consideration in our analysis.

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## 2. Method

*2-1. Design and Participants.*

The survey data were collected via the Internet. Data collection was conducted in two stages—the first at the end of December 2010 and the second at the end of March 2011. The earthquake occurred just before the second stage.

All participants were aged between 20 and 39 years. The first survey was completed by 20,000 people, including those who were in afflicted areas, and the second survey was completed by 16,000 people, but it was not conducted in the afflicted area. The number of participants that completed surveys in both periods was 10,744 (53.01% male, 46.99% female; 20.34% from 20 to 24 years old, 22.98% from 25 to 29 years old, 26.35% from 30 to 34 years old, and 30.32% from 35 to 39 years old).

Because of the internet sample, we should examine how they were the representative of the Japanese citizens. The ratio of male/female and the age distribution was closely representative of the national distribution for Japanese citizens in this age group in March 2010. Residential area distribution was also representative, once the excluded prefectures (afflicted areas, such as Tohoku areas and Ibaragi prefecture) had been removed (4.35% Hokkaido, 37.45% Kanto, 3.97% Hokuriku, 4.12% Tōhoku, 11.55% Tokai, 18.47% Kinki, 6.14% Chugoku, 2.95% Shikoku, 6.72% Kita-Kyushu, and 4.28% Minami-Kyushu), and so was employment status (61.28% were full time employees or students, including company owner or family owning business together; 19.03% were part timers, including staff dispatched for temporary work; 19.69% were not in employment). Thus, we confirmed that this sample was not distorted by sampling bias. Prior to the main analysis, we conducted a macro-level (prefecture level) analysis to examine whether a geographical proximity effect existed, but this effect was not significant.

*2-2. Procedure.*

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The participants were first recruited from a large Internet survey company. All participants who completed the first survey, except for people in the afflicted area, were asked to complete the second survey. They all agreed to complete the survey about their personal attitude and lifestyle, and for completion of each survey, participants received a coupon that could be used in online shopping. Participants understood that their answers would be used in analyses while their anonymity would be maintained.

*2-3. Measures.*

*General well-being.* For both survey periods, we asked participants to rate their general well-being on the basis of a question used in the European Social Survey: “To what extent are you happy?” (0=very unhappy, 10=very happy; Inglehart, 1997). For the second survey, we also asked participants to rate their ideal level of well-being on the basis of the question: “What describes your best and ideal condition about the level of happiness?” (unhappy all the time = 0, happy half the time and unhappy half the time = 5, and happy all the time = 10). Having answered these questions on the general well-being index, the participants were then asked to judge the extent to which they were thinking about the Great East Japan earthquake when answering those questions (1 = thinking about the earthquake a lot, since family members or relatives were among the victims, 2 = thinking about the earthquake, since friends or acquaintances were among the victims, 3 = thinking about the earthquake even though none of my relatives were among the victims, 4 = not thinking about the earthquake very much, 5 = not thinking about the earthquake at all).

*Temporary negative emotion.* In the first survey, we asked participants to rate the following emotional reactions in terms of frequency: “I feel depressed,” “I feel like crying or cry,” and “I cannot sleep well at night,” ( $\alpha = .70$ ) according to a 4-point scale (1 = never, 2 = sometimes, 3 = mostly, 4 = always). In the second survey, we asked participants to rate the same emotional

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conditions but, this time, we asked how frequently they experienced them in the last week ( $\alpha = .71$ ), according to a 4-point scale (1 = never, 2 = a little (once a week), 3 = quite a lot (on three or four days), 4 = frequently (on more than 5 days). Since the two questions were concerned with different timescales, we have to be careful when comparing negative emotions before and after the earthquake. However, the responses still give us important information about how people's emotional states may have changed following the earthquake, especially in terms of individual differences.

*Attitude toward life after the earthquake.* For the second survey period, we included several items assessing how individual attitude toward life have changed following the earthquake. This was assessed by analyzing participant responses to the following question: “After the Great East Japan earthquake, to what extent do you think your thoughts of life and well-being have changed?” The participants answered according to a 5-point scale (1 = changed a lot, 2 = changed somewhat, 3 = don't know, 4 = changed very little, 5 = not changed at all). Those participants who gave a rating of 1 or 2 were then asked to judge to what extent their attitude toward life changed with 10 items (1 = not at all, 5 = very much). Factor analysis (maximum likelihood, promax rotation) found three factors: 1) evaluation of ordinary life and connectedness (5 items,  $\alpha = .98$ , e.g., “I have started to appreciate the importance of my ordinary life and how this makes me happy,” or “I value my relationships with family members and friends”), 2) evaluation of individual efforts (2 items,  $\alpha = .97$ , e.g., “I have begun to place more value on gaining fulfillment in my job or school”), and 3) the futility of life (2 items,  $\alpha = .89$ , i.e., “I have begun to feel a sense of futility—it seems that, even if I work hard, all of this will be in vain afterwards”). One item was deleted from the analysis, since the factor loading score was high both for factor 1 and factor 3. The average scores for each of the sub-scales will be reported.

*Prosocial behavior.* In the second survey, we asked participants about 12 behaviors after the

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earthquake, including temporarily or permanently moving away from the east part of Japan or buying a lot of mineral water. The participants were asked whether they and their family engaged in or intended to engage in the behaviors after the earthquake. In this paper, we focus on three behaviors: financial donation, in-kind donation, and volunteer work to support afflicted persons. The answers consisted of six options (“I have never considered doing it,” “I considered it somewhat, but haven’t done it yet,” “I considered it seriously, but haven’t done it yet,” “I have already done it, but am not now,” “I am doing it now,” and “I am doing the same thing as before the earthquake”).

### 3. Results

#### 3-1. *Change in General Well-being.*

We examined the following hypotheses: 1) general well-being related to eudaimonia would increase after the earthquake and 2) those changes would vary according to how focused each individual was on the earthquake; this would mean that for those people who did not focus on the incident, no change in happiness would occur.

First, we tested the correlations between general well-being in period 1 and period 2. The within participants correlation between the two periods of well-being was quite high ( $r = .72$ ,  $p < .0001$ ), suggesting that there are only little individual differences in the extent to which well-being changed following the earthquake. The mean score of the first period was 6.05 ( $SD = 2.33$ ) and that of the second period was 6.06 ( $SD = 2.26$ ),  $t(10743) = 0.53$ ,  $n.s.$  Ideal well-being measured in the second period was found to correlate moderately with the first and second period of well-being ( $r = .27$  and  $.33$ ,  $ps < .0001$ , respectively).

In terms of thinking about the earthquake while they were responding to the well-being index, 11.9% of participants confirmed that they were, as they had family members, relatives,

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friends, or acquaintances who were suffering as a result of the earthquake. This group will be referred to as the VR group (victim relatives). 40.3% of the participants reported thinking about the earthquake even though they did not know any victims. This group is referred to as the TE (thinking about the earthquake) group ( $N = 4,326$ ). 28.7% reported that they were thinking about the earthquake “not very much,” and 19.2% answered “not at all.” The last two groups were labeled as the NTE group (not thinking about the earthquake ( $N = 5,146$ )). For the VR group, it was difficult to identify the specific severity of the damage that the earthquake had had on their relatives, so we excluded this group from the next analysis. Males tended to be more in NTE groups (57.6% of males and 50.6% of females were in NTE group;  $\chi^2 = 46.23$ ,  $p < .0001$ ) but employment status did not affect TE vs. NTE categorization ( $\chi^2 = 3.14$ ,  $n.s.$ ).

Preliminary analyses suggested that there were main effects of gender (females were happier than males) and employment status (full time employees were happier than part timers and people who are not in employment), but none of them qualified the change of general well-being before and after the earthquake. We conducted an ANOVA on general well-being (first period vs. second period) by TE vs. NTE group. The main effect of general well-being (time differences) was not found to be significant ( $F(1, 9470) < 1$ ,  $n.s.$ ), but the subjective effect of earthquake was found to be significant ( $F(1, 9470) = 44.67$ ,  $p < .0001$ ); this suggests that those in the TE group ( $M = 6.19$ ) generally had higher well-being than those in the NTE group (5.90). More importantly, we found a significant interaction between the subjective effect of the earthquake and general well-being ( $F(1, 9470) = 5.92$ ,  $p < .015$ ), showing that 1) That those in the TE group had higher well-being than those in the NTE group before the earthquake, and 2) That those in the TE group increased their general well-being after the earthquake ( $p < .05$ ), while those in the NTE did not change their well-being (see Figure 1).

In addition, when comparing the post-earthquake ratings of ideal level of well-being and

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their real evaluation of well-being by 2 (ideal vs. real) x 2 (TE group vs. NTE group), those in the NTE group gave higher ratings for ideal well-being ( $M=7.07$ ) than those in the TE group ( $M = 6.94$ ),  $t(9470) = 3.25, p < .001$ ) and the gap between real vs. ideal was larger for NTE group than TE group ( $F(1, 9470) = 84.47, p < .0001$ ).

### 3-2. *Temporary negative emotion.*

We examined the prediction that temporary negative emotion related to hedonic well-being would increase after the earthquake, and that those changes would vary according to how focused each individual was on the earthquake.

We conducted an ANOVA on the data from both surveys regarding temporary negative emotions, to examine the subjective effect of the earthquake (TE vs. NTE) x gender x employment status (full time employees and students, part timers, and people who are not in employment), since our preliminary analysis suggested that gender and employment status qualified the change of temporary negative emotion. The main effect of negative emotions was not significant ( $F < 1, n.s.$ ), but the interaction between negative emotions by the subjective effect of the earthquake was significant ( $F(1, 9460) = 5.04, p < .03$ ). The TE and NTE groups felt the same level of negative emotions before the earthquake, but after the earthquake, those in the TE group were more likely to feel negative emotions than those in the NTE group (Figure 2). In addition, females tended to feel a greater number of negative emotions than males ( $F(1,9460) = 31.31, p < .0001$ , female = 1.80, male = 1.63), and this main effect was qualified by the period of the survey ( $F(9460) = 51.07, p < .0001$ ), showing that females tended to feel a greater number of negative emotions after the earthquake while males experienced fewer. Full time employees and students were less likely to feel negative emotions ( $M = 1.70$ ) than part timers ( $M = 1.75$ ) and people who were not in employment ( $M = 1.83$ ;  $F(1, 9460) = 28.38, p < .0001$ ). This main effect was qualified by the period of the survey ( $F(1, 9460) = 9.45, p < .0001$ ), indicating that

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differences between groups were decreased after the earthquake.

The correlations between two indices (general happiness vs. temporary negative emotions) were negative ( $r = -.41, p < .0001$  for the first period and  $r = -.35, p < .0001$ , for the second period), but the moderate correlation coefficient showed that these indices functioned independently of each other.

### 3-3. Attitude toward life *after the earthquake*.

For the first question—“to what extent do you think your thoughts of life and well-being has been changed,” 13% of respondents answered “changed a lot,” 45% answered “changed somewhat,” 21% answered “don’t know,” 14% answered “changed very little,” and 7% answered “not changed at all.” Approximately 60% of the sample reported that their attitude toward life had changed at least “somewhat” after the earthquake and they were asked to judge what kind of change they experienced.

We conducted an ANOVA for the three domains of the change of attitude toward life (evaluation of ordinary life and connectedness, evaluation of individual effort, and the futility of life) x gender x employment status (full time employees and students, part timers, and people who are not in employment). We found a main effect of change domain ( $F(2, 12484) = 1366.53, p < .0001$ )—participants experienced attitude change toward ordinary life and connectedness more intensely ( $M = 3.58$ ) than in terms of individual effort ( $M = 3.08$ ) or futility of life ( $M = 2.64$ ). This main effect was qualified by gender ( $F(2, 12484) = 62.93, p < .0001$ ), which showed that a stronger emphasis on values of ordinary life and connectedness was experienced by female respondents than male respondents. Furthermore, the interaction between change domain and employment status was significant ( $F(4, 12484) = 16.98, p < .0001$ ), such that part timers reported a smaller change in their emphasis on values of ordinary life and connectedness and a larger change in attitude of individual effort and futility of life than the other two groups (see



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Figure 2).

To examine the relationships between changes across change domains and general well-being, we conducted a regression analysis on the general well-being of the participants after the earthquake by gender (1 = male, 2 = female), employment status (1 = full time employees and students, 2 = part timers, 3 = unemployed), change in three domains of changes (we included participants who did not experience attitude change by scoring “0” for each component), and general well-being before the earthquake. Our results suggested that after controlling for general well-being before the earthquake, reevaluation of ordinary life and connectedness positively predicted general well-being after the earthquake ( $\beta = .13$ ,  $t = 6.47$ ,  $p < .0001$ ). Individual effort was not found to have a significant effect, and a stronger change towards futility in life negatively predicted general well-being after the earthquake ( $\beta = -0.96$ ,  $t = -6.83$ ,  $p < .0001$ ). Females were happier than males ( $\beta = .05$ ,  $t = 6.56$ ,  $p < .0001$ ), and employment status did not have a significant effect.

#### 3-4. *Prosocial behavior.*

Participants engaged in three kinds of prosocial behaviors: 61.7% and 12.8% gave financial and in-kind donations, respectively, and 3.67% engaged in volunteer work. Our logit analysis revealed that even after controlling for individual demographic and socio-economic factors, the TE group gave in-kind donations and did volunteer work more than did the NTE group (Table 1). Those who reported changed attitude toward life engaged in all three prosocial behaviors more than did those whose attitude was unchanged.

Other factors that affected prosocial behaviors were also identified. For instance, females gave financial and in-kind donations more than males did, and males engaged in volunteer work more than females did. Individuals who had a child under three years old gave in-kind donations more than did those without young children. Those who had a low income did not give donations

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but did volunteer works. Those who worked regularly did not do volunteer works but gave donations. Those who watched or listened to information about the earthquake gave donations more than those who did not.

## 4. Discussion

The present results suggest that those who were thinking about the earthquake (TE) had higher well-being than those who were not thinking about the earthquake (NTE), and that these groups already differed before the earthquake. Only those in the TE group had increased general well-being after the earthquake. The TE group was more likely to change their definition of well-being (eudaimonia) after the earthquake. This was supported by the reevaluation of their ordinary life, and relatedness appears to have prompted them to become more satisfied with their current life conditions. Those who felt less general well-being before the earthquake were less likely to reflect upon the earthquake and did not tend to change their definitions of well-being. The NTE group experienced a larger ideal-real well-being gap, which shows they did not feel satisfied with their situation.

Respondents in the TE group showed an increase in general well-being after the earthquake, but they were also more likely to experience a greater number of temporary negative emotions and engage in prosocial behaviors after the earthquake than were those in NTE group. These results suggest that those in the TE group were more likely to feel sympathy, empathy, and sadness about the afflicted areas and thus change their own definition of eudaimonic well-being. In contrast, those in the NTE group did not change either hedonic nor eudaimonic well-being.

The discrepancy between those two indices (hedonic vs. eudaimonic well-being) is noteworthy. In fact, these results support the Two Continua Model proposed by Keyes and colleagues. Keyes (2005) examined the relationship between mental health and mental illness and

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found that they are predicted as related but distinct dimensions. In addition, Westerhof and Keyes (2010) suggested that older adults have fewer mental problems, but they do not have better mental health than younger adults.

The results of attitude change suggest that young Japanese adults were more likely to experience attitude toward life changes after the earthquake in a positive direction by reevaluating their ordinary life and social connectedness in light of the disaster. This type of attitude change was related to increased general well-being, as is suggested in the previous literature proposing that eudaimonic well-being is related to social connectedness and meaning of life. The results also showed that the TE group also engaged in prosocial behaviors more than the NTE group did, and that those who changed their life attitude engaged in all three prosocial behaviors more than did those whose life attitude were unchanged. Therefore, we can conclude that change in eudaimonic well-being and attitude change promoted prosocial behaviors after the earthquake.

The different reactions of part timers toward life might reflect the recent individualism of a growing number of Japanese young adults who have lifestyles that deviate from the traditional norms that dominate Japanese society, such as *Freeters*, a term that refers to those who do irregular, non-standard work. However, they still showed greater changes in their evaluation of ordinary life and connectedness than in the other two categories (evaluation of individual effort and the futility of life).

## 5. Conclusion

Our analysis suggested that many young people who live in areas that were not directly affected by the earthquake reevaluated their social conditions and relationships following the disaster. About half of the respondents reported thinking a lot about the earthquake and changing

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their definition of eudaimonic well-being following the earthquake. This group might attempt to reevaluate their ordinary environmental and social relationships. Fewer of them reported experiencing the futility of life. Those who thought a lot about the earthquake were more likely to give donations and do volunteer works.

Related to this issue, the Terror Management Theory (TMT) proposes that the exposure to reminders of death activates the formation and maintenance of close relationships (Mikulincer, Florian, & Hirschberger, 2003) in addition to the validating one's cultural worldview and enhancing self-esteem. Future research should investigate how the effects of natural disaster are related to the Terror Management Theory. On the other hand, people who watch news of the afflicted area could feel empathy, which in turn could lead to vicarious traumatization (McCann & Pearlman, 1990). This is more likely to be experienced by people who worked with strong empathic engagement to help victims. For example, journalists working in the afflicted areas in the Great East Japan Earthquake experienced trauma (Uchida, Takenishi, Kanagawa, Harada, Okawa, & Yabuno, 2012). Future studies using a longitudinal analysis are needed to clarify this shared traumatic experience.

Several studies have suggested that Japanese people are more likely than Americans are to actualize their happiness from their perceived emotional support from others (Uchida, Kitayama, Mesquita, Reyes, & Morling, 2008) and their socially engaging emotions, such as friendly feelings (Kitayama, Mesquita, & Karasawa, 2006). This basic tendency might be amplified after the disaster. Alternatively, we could also predict that even in independently oriented social settings, social connections would take on a more important role during the reconstruction of a society following a severe disaster. This prediction should be examined in future research.

Future studies should also identify the characteristics of people who belonged to the TE

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and NTE groups. Males were more likely to be in the NTE group than were females, and employment status did not differ between groups. We could not find other demographic factors that clearly distinguished both groups. This implies that the role of other psychological factors, such as personality or emotional states (e.g., loneliness), should be explored as much as possible to establish discriminate variables.

Research on the psychological impact of disasters has been mainly focused on post-traumatic disorders or on mental health issues occurring in the afflicted area. This research shows that nationwide disasters affect general well-being and temporary negative emotions even for people in the areas that are not directly damaged. Although this effect is limited to people who have a high sensitivity and capacity to feel sympathy and empathy for those afflicted, these results have important implications for reconstruction after an immense disaster. In the face of such a disaster, we hope that people who have changed their psychological state will help those throughout the nation to rediscover their resilience.

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## Changes in well-being after a severe nationwide disaster 1

Table 1

*Relationship between attitude change toward life and prosocial behaviors (Logit Analysis)*

	Financial donations		In-kind donations		Volunteering	
	(1)	(2)	(1)	(2)	(1)	(2)
General well-being	0.011 (0.010)	0.011 (0.010)	0.021 (0.014)	0.022 (0.014)	0.009 (0.025)	0.009 (0.025)
VR	-0.008 (0.069)	0.009 (0.070)	0.780 (0.087) ***	0.762 (0.088) ***	0.771 (0.155) ***	0.732 (0.157) ***
TE	0.052 (0.046)	-0.042 (0.068)	0.237 (0.067) ***	0.370 (0.111) ***	0.506 (0.120) ***	0.720 (0.184) ***
Attitude change	0.650 (0.044) ***	0.588 (0.055) ***	0.368 (0.066) ***	0.443 (0.083) ***	0.258 (0.116) *	0.408 (0.153) **
TE * Attitude change		0.166 (0.089)		-0.198 (0.132)		-0.340 (0.225)
pseudo R2	5.451186E-02	5.48E-02	3.71E-02	3.73E-02	3.26E-02	3.32E-02
AIC	13574	13572	7980	7980	3318	3318

Notes: \* $p < .05$ ., \*\* $p < .01$ ., \*\*\* $p < .001$ . Values in parentheses denote standard errors.

VR: victim relatives =1, others =0

TE: Thinking about the Earthquake (TE) =1, others =0

Attitude change: Those who changed attitude toward life after the earthquake =1, others=0

Analysis (2) included the interaction between TE and Attitude change

## Changes in well-being after a severe nationwide disaster 1

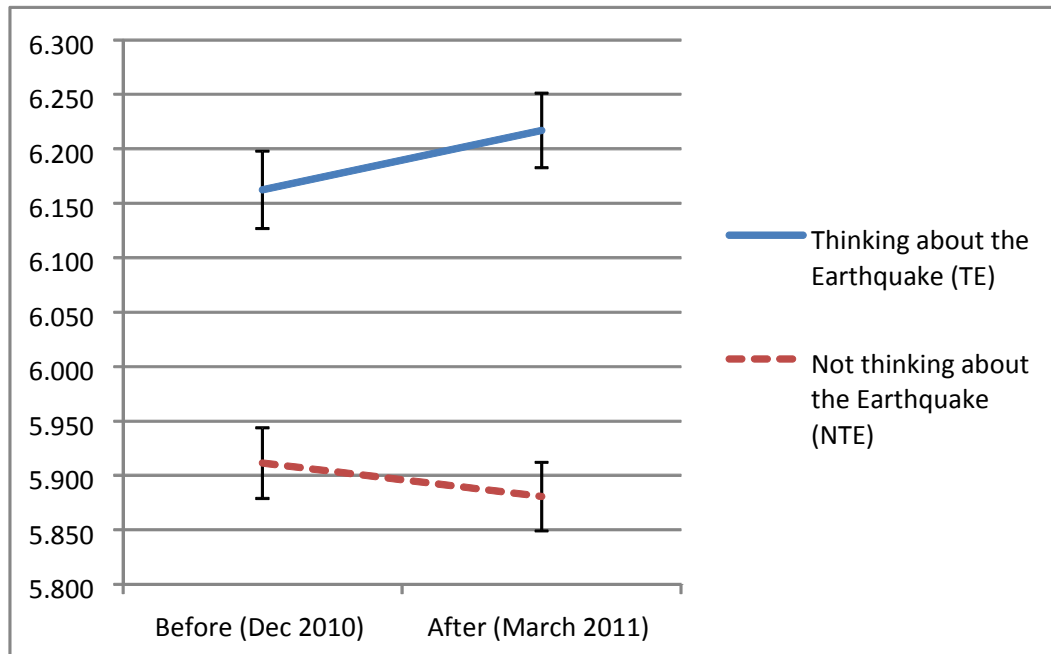


Figure 1. Changes in general well-being after the earthquake.

## Changes in well-being after a severe nationwide disaster 2

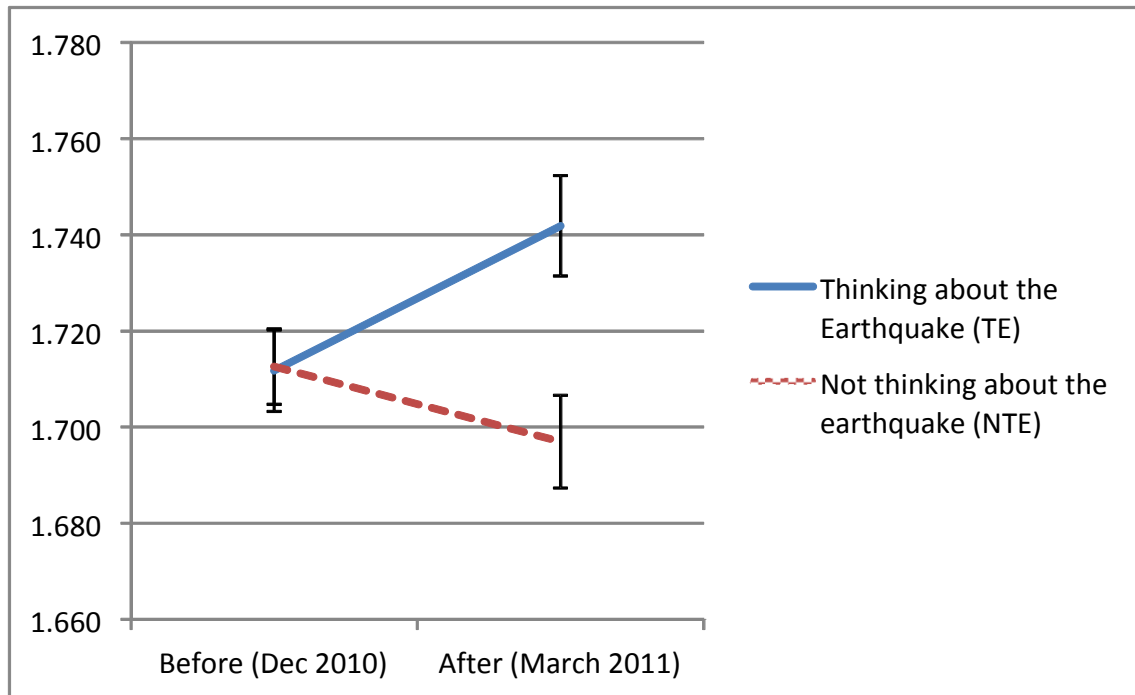


Figure 2. Temporary negative emotions before and after the earthquake.

### Changes in well-being after a severe nationwide disaster 3

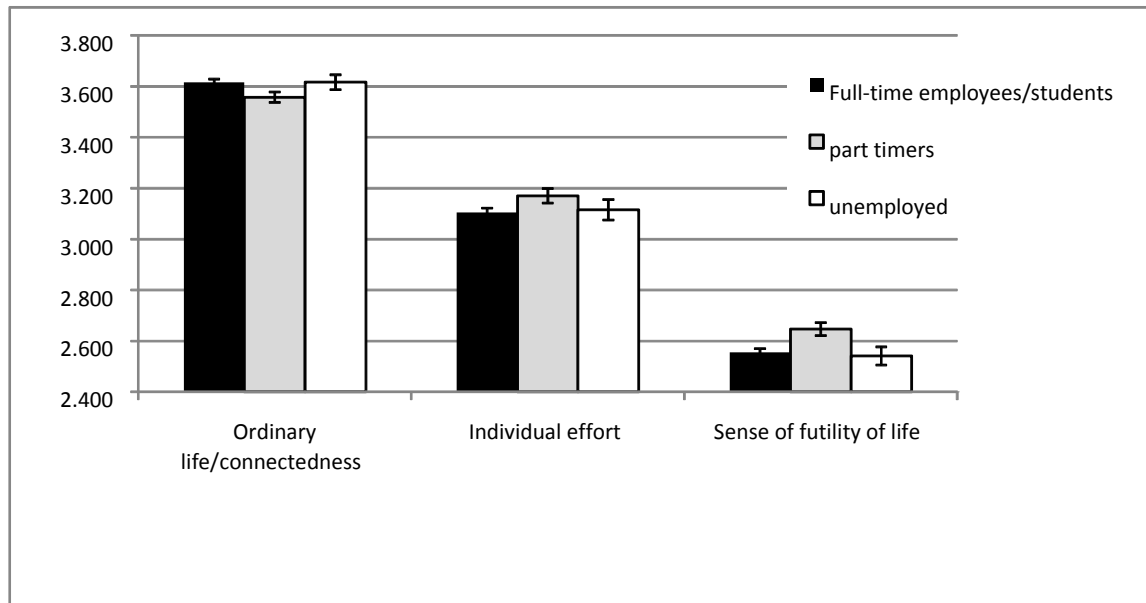


Figure 3. Attitude change toward life after the earthquake, by occupation.